

WHAT IS CLAIMED IS:

1. A brace apparatus to be mounted between two portions of a structure subjected to a loading force to limit movements due to the loading force, said brace apparatus comprising:

 a fixed portion having a first end to be mounted to a portion of the structure; said first end defining a first abutting surface and a second end defining a second abutting surface;

 a movable portion having a first end to be mounted to a portion of the structure; said first end defining a first abutting surface and a second end defining a second abutting surface;

 a tensionable assembly mounting said movable portion to said fixed portion so that a) said first movable portion abutting surface is in proximity of the second fixed portion abutting surface, and b) said first fixed portion abutting surface is in proximity of the second movable portion abutting surface; said tensionable assembly including a first abutting element in the proximity of the first end of the fixed portion and a second abutting element in the proximity of the first end of the movable portion; said first and second abutting elements being interconnected by an adjustable tensioning element;

wherein, i) when a loading force moves the movable portion away from the fixed portion, said first abutting element abuts the first fixed portion abutting surface and said second abutting element abuts the first movable element abutting surface to thereby limit the movement of the movable portion away from the fixed portion and ii) when a loading force moves the movable portion towards the fixed portion, said first abutting element abuts the second movable portion abutting surface and said second abutting element abuts the second fixed element abutting surface to thereby limit the movement of the movable portion towards the fixed portion.

2. A brace apparatus as recited in claim 1, wherein said tensioning element is pre-tensioned.
3. A brace apparatus as recited in claim 2, wherein tensioning element is pre-tensioned at a pre-tension level ranging from 60% of a maximum allowed deformation of said tensioning element to a value corresponding to no pre-tension.
4. A brace apparatus as recited in claim 3, wherein said movable portion moves with respect to said fixed portion when the loading force overcomes said pre-tension level.
5. A brace apparatus as recited in claim 4, wherein said tensioning element elongates when the loading force overcomes said pre-tension level such that an additional tension force builds-in said tensioning element as said apparatus is moved from a rest position to a transitional position, said additional tension force being able to restore said apparatus back to said rest position when the loading force ceases.
6. A brace apparatus as recited in claim 2, wherein said tensioning element is a longitudinally extending threaded member attached to said first and said second abutting elements via nuts.
7. A brace apparatus as recited in claim 2, wherein said tensioning element is a tendon fixedly mounted to said first and said second abutting elements.
8. A brace apparatus as recited in claim 2, wherein said tensioning element

includes more than one tensioning elements which are symmetrically positioned with respect to said first and second abutting elements.

9. A brace apparatus as recited in claim 1, wherein said fixed portion and said mobile portion have tubular bodies and said mobile portion is located inside said fixed portion.
10. A brace apparatus as recited in claim 9, wherein said mobile portion is concentric with said fixed portion.
11. A brace apparatus as recited in claim 9, wherein said tensioning element is located within said fixed portion.
12. A brace apparatus as recited in claim 1, wherein said fixed portion includes two fixed portions positioned on each side of said mobile portion.
13. A brace apparatus as recited in claim 12, wherein said brace apparatus further includes guiding elements securely mounted to said first abutting element and said second abutting element, said guiding elements being provided in proximity of said second end of said mobile portion and said second end of said fixed portions for providing guidance upon relative movement of said mobile portion and said fixed portions.
14. A brace apparatus as recited in claim 12, wherein said tensioning element is located within said mobile portion.

15. A brace apparatus as recited in claim 1, wherein said apparatus further includes an energy dissipation system linking said fixed portion to said mobile portion, said energy dissipation system being operable upon a relative movement between said fixed portion and said mobile portion for dissipating energy.
16. A brace apparatus as recited in claim 15, wherein said energy dissipation system includes a friction mechanism including a support member securely mounted to said fixed portion, and an extending member securely mounted to said mobile portion and extending to said support member such as to be in a frictional contact with said mobile portion.
17. A brace apparatus as recited in claim 16, wherein said support member includes a slot and wherein said extending member is mounted in a clamping arrangement with said support member via fasteners engaging said slot for generating said frictional contact upon said relative movement between said fixed portion and said mobile portion.
18. A brace apparatus as recited in claim 16, wherein said friction mechanism further includes a friction interface located between said support member and said extending member, said friction interface being so configured and sized as to provide friction upon said relative movement between said fixed portion and said mobile portion.
19. A brace apparatus as recited in claim 15, wherein said friction mechanism includes two friction mechanisms, each located near said first ends and said second ends.

20. A brace apparatus as recited in claim 19, wherein said extending members each include a slot configured and sized as to receive a fastener clamping said extending member to said support member, each of said slot and fastener being mounted in a sliding arrangement for providing a restrained movement of said friction element upon movement of said fixed portion and said mobile portion.
21. A brace apparatus as recited in claim 15, wherein said energy dissipation system includes a yielding mechanism including metallic elements mounted to said fixed portion and said mobile portion, said metallic elements being so configured and sized as to yield under deformations generated from a relative movement between said fixed portion and said mobile portion.
22. A brace apparatus as recited in claim 15, wherein said energy dissipation system includes a viscous mechanism including viscous fluids contained within a device mounted to said fixed portion and said mobile portion and which deforms upon a relative movement between said fixed portion and said mobile portion.
23. A brace apparatus as recited in claim 15, wherein said energy dissipation system includes a visco-elastic mechanism including a visco-elastic material mounted to said fixed portion and said mobile portion which deforms upon a relative movement between said fixed portion and said mobile portion.
24. A brace apparatus as recited in claim 15, wherein said energy dissipation system includes at least one dissipation mechanism selected from the

group consisting of a friction mechanism, a yielding mechanism, a viscous mechanism and a visco-elastic mechanism exhibiting a flag-shaped hysteresis behavior of said brace apparatus when subjected to the loading force.

25. A brace apparatus as recited in claim 1, wherein said apparatus further includes an end connection protruding from at least one of said first ends and a fuse system including a slipping element mounted to said end connection and mounted to one of the two portions of the structure, said fuse system being so configured and sized as to slip with respect to said end connection at a predetermined slip load which is higher than the loading force.
26. A brace apparatus as recited in claim 25, wherein said slipping member is mounted in a frictional cooperation to said end connection via fasteners engaged within slots in said end connection for providing an under friction slip movement between said brace apparatus and the structure.
27. A brace apparatus as recited in claim 25, wherein said end connection includes an extending member securely mounted on said mobile portion and in a frictional cooperation with a support member securely mounted to said fixed portion.
28. A brace apparatus as recited in claim 27, wherein said extending member includes a slot clamping said support member to said extending member via fasteners engaging said slot for generating friction upon said relative movement between said fixed portion and said mobile portion under the loading force.

29. A brace apparatus as recited in claim 28, wherein said predetermined slip load generates a maximum allowable relative movement between said fixed portion and said mobile portion.
30. A brace apparatus as recited in claim 29, wherein said slots have a length defined by opposed edges and wherein said maximum allowable relative movement between said fixed portion and said mobile portion corresponds to said fasteners bearing on said opposed edges of said slots.
31. A brace apparatus as recited in claim 1, wherein said first end of said fixed portion is slidably mounted to said first abutting element and said first end of said mobile portion is slidably mounted to said second abutting element.
32. A brace apparatus as recited in claim 1, wherein said first end of said fixed portion and said first end of said mobile portion include threaded end connections for mounting said brace apparatus to the two portions of the structure.
33. A brace apparatus as recited in claim 1, wherein said apparatus further includes guiding elements provided between said fixed portion and said mobile portion for guiding a relative movement between said fixed portion and said second portion.
34. A brace apparatus as recited in claim 33, wherein said guiding elements include absorbing elements mounted between said fixed portion and said mobile portion for mitigating impact when said mobile portion is relatively

moving with respect to said fixed portion.

35. A brace apparatus mountable between two portions of a structure subjected to a loading force, said brace apparatus comprising:

- a) a first bracing member having a first end mountable to one of the two portions and a second end, each having an abutting surface;
- b) a second bracing member having a third end and a fourth end mountable to another one of the two portions and each having an abutting surface, said first and second bracing members being movably operable between a rest position and a transitional position such that:
 - i. said first end is in proximity of said third end so as to define a first proximity end pair and said second end is in proximity of said fourth end so as to define a second proximity end pair;
 - ii. said first end is opposed to said fourth end so as to define a first opposed end pair and said second end is opposed to said third end so as to define a second opposed end pair;
- c) a tensionable assembly including abutting elements in the proximity of said first and second proximity end pairs, said abutting elements being interconnected by a tensioning element;

whereby said first and second bracing members are movable apart when the loading force applied to said first opposed end pairs i) tensions said apparatus such that respective abutting surfaces of said first opposed end pair abuts on respective abutting elements; ii) compresses said apparatus such that respective abutting surfaces of said second opposed end pair abuts on respective abutting elements; said tensioning element being tensionable under the loading force such as to alternatively move said first and second bracing members from said rest position to said transitional position.